The Long Term Results of the Hybrid Therapy of Atrial Fibrillation and Risk Factors for the Recurrence of Atrial Fibrillation

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Abstract

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Background: The Hybrid therapy, catheter ablation of the inferior vena cava — tricuspid annulus isthmus and continuation of anti-arrhythmic drug (AAD) therapy have been shown to be an effective hybrid therapy for atrial flutter (AFL) which results from AAD treatment of atrial fibrillation (AF). The aim of this study was to verify of Korean result and to determine the risk factors for recurrence of AF in patients undergoing hybrid therapy for anti-arrhythmic drug-induced AFL

Methods: 33 patients (mean age 57.1 ± 10.8, male 30) with paroxysmal (n=23) or persistent AF (n=10) who had not pre-ablative AFL episode, developed AFL due to the administration of amiodarone (n=4), flecainide (n=24), propafenone (n=4) or sotalol (n=1). Pre-ablative clinical and echocardiographic data were collected retrospectively. During clinical follow-up, regular ECG & Holter monitoring were performed as scheduled. Recurrence of AF after ablation was assessed during follow-up on continued AAD therapy and during long-term follow-up.

Results: During the follow-up on continued AAD therapy (63.7 ± 53.0 months), AF was recurred in 15 of 33 patients (45.5%). Pre-ablative AF duration (p=0.023) & left atrial diameter (p=0.027) were different between two groups (recurrence & no recurrence group) in statistically. AF and LA size is correlated with each others

significantly(r=0.367, p=0.042). The risk factors for the recurrence of AF in patients with Hybrid therapy were pre-ablative LA size (odds ratio 7.5, CI of 95% 1.494 – 37.66, p=0.010), and pre-ablative AF duration (odds ratio 5.2, CI of 95% 0.899 – 30.078, p=0.049). Despite of recurrence of AF, symptomatic events of AF were reduced from 9.2 to 3.1 episodes per year. Long term AF free survival is more longer in patients of normal LA size (<44mm) than in patients of enlarged LA size [event free duration mean 985 ±77 days vs. 304 ± 91 days, p = 0.0054]

Conclusion: The Hybrid therapy of drug induced AFL from AF is an effective therapy enough to guarantee the long term AF free duration. The risk factors associated with the recurrence of AF in Hybrid therapy are pre-ablative atrial fibrillation duration and enlarged LA size. Careful selection of patient for Hybrid therapy will be warranted for long term AF free survival.

Keywords: Hybrid therapy, atrial fibrillation, atrial flutter, Class Ic/III anti-arrhythmic drug

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I. INTRODUCTION

Typical atrial flutter can be documented following initiation of anti-arrhythmic drug therapy in patients with paroxysmal or persistent atrial fibrillation. Catheter ablation of the inferior vena cava — tricuspid annulus isthmus and continuation of anti-arrhythmic drug therapy(Hybrid therapy) have been shown to be an effective treatment of anti-arrhythmic drug induced atrial flutter[1-4]. Although a high initial successful rate of stable sinus rhythm has been described in patients with Hybrid therapy, post-ablation atrial fibrillation can recur during follow-up despite the continuation of anti-arrhythmic medication. And the long term atrial fibrillation free survival has not been clearly defined and the risk factors for the recurrence of atrial fibrillation in patients undergoing Hybrid therapy have not been identified, too.

In this setting, this study was aimed to verify of long term success rate of the Hybrid therapy of atrial fibrillation and to identify the independent risk factor of recurrence after the Hybrid therapy in patients with atrial fibrillation

II. MATERIALS AND METHODS

Subject

In the data base of atrial flutter ablation done between January, 1999 and May, 2005, a total of 230 cases ablated due to atrial flutter were reviewed. The study population who developed atrial flutter after anti-arrhythmic drug therapy for atrial fibrillation without evidence of pre-ablative atrial flutter consisted of 33 (14.3% of total atrial flutter ablation cases) consecutive patients with atrial flutter induced by anti-arrhythmic drug therapy for paroxysmal or persistent atrial fibrillation, which had not been documented before the initiation of anti-arrhythmic drug therapy.

Baseline clinical characteristic data including age, sex, co-morbidity (hypertension, coronary artery occlusive disease, valvular heart disease, acquired or congenital heart disease, dilated cardiomyopathy or hypertrophic cardiomyopathy) were evaluated. All patients underwent non-invasive cardiac examination including M-mode and two dimensional echocardiography with color Doppler flow analysis. Left atrial enlargement was defined as a left atrial anterior-posterior diameter more than 44 mm. Definition of structural heart disease included left ventricular ejection fraction less than 60%, significant coronary heart disease or valvular heart disease or another congenital or acquired cardiomyopathy.

Electrophysiological study

Written informed consent was obtained from all patients. All patients with persistent atrial flutter had been anticoagulated for at least three weeks before the electrophysiological study, otherwise the existence of thrombi in the left atrium had to be excluded by transesophageal echocardiography. Multipolar electrode catheters were positioned in the inferoanterior right atrium, the His bundle region and the coronary sinus ostium. Annular activation during atrial flutter or atrial pacing was assessed by a 10-pole electrode halo catheter, Decapola catheter(St Jude Medical, Daig, USA). In patients with atrial flutter at the onset of the procedure, mapping, transient entrainment and overdrive stimulation to restore sinus rhythm were performed. In patients presenting with sinus rhythm, induction of atrial flutter was attempted by programmed stimulation with single and double extra-stimuli and by atrial burst pacing. Electrophysiological definition of typical atrial flutter was based on the typical activation sequence in counter-clockwise or clockwise direction in the right atrium and by the criteria of entrainment as described by Waldo et al[5]. When atrial fibrillation was present at the beginning of the electrophysiological study or occurred during the procedure, it was terminated by a synchronized direct current shock under brief anesthesia with propofol. In patients with recurrent atrial fibrillation, only limited attempts were made to induce atrial flutter.

Catheter ablation of atrial flutter

If a typical isthmus-dependent flutter circuit with a counterclockwise or clockwise activation sequence around the tricuspid annulus was identified, patients underwent radiofrequency catheter ablation. Ablation was performed by creating a linear lesion between the tricuspid annulus and either the inferior vena cava or the Eustachian ridge. If atrial flutter terminated during radiofrequency application, pulse propagation at the targeted isthmus was determined during pacing at the coronary sinus and the low right atrium adjacent to the ablation line. In addition, the occurrence of double potentials at the ablation line was documented. Catheter ablation was considered to be successful if a complete conduction block could be demonstrated by pacing and if a continuous line of double potentials was found at the ablation line. Otherwise, radiofrequency application was repeated. All patients underwent electrophysiological reevaluation 30 min after the catheter ablation and were monitored for at least 24 h in our hospital.

Follow-up

Patients were instructed to continue the anti-arrhythmic agent which had initiated the conversion of atrial fibrillation to atrial flutter. Most patients received warfarin to maintain INR 2.5–3.5 for at least one month after the ablation. In some patients presenting with sinus rhythm, no indication for systemic anticoagulation existed, they were treated with aspirin 100 mg daily after the ablation. All patients had a close follow-up in our out-patient clinic. Patients with palpitations or symptoms

suggestive of atrial fibrillation or atrial flutter underwent ECG and Holter monitoring. Recurrent atrial fibrillation was diagnosed if it was documented by ECG or Holter monitoring. In addition, patients were asked to report whether their clinical situation was improved, unchanged or worsened and whether undesirable effects of the ablation procedure or the drug therapy had occurred.

All patients were followed up for 63.7 ± 53.0 months (range 8.2 ~ 71.5 months) with a clinical examination and ECG recording scheduled every month or Holter monitoring if patient was symptomatic. Patients were instructed to obtain an ECG record in case of symptomatic palpitation. Total patients group, the patients who were not recurred of atrial fibrillation(defined by Group 1) and patients who were recurred of atrial fibrillation(defined by Group 2) were all analyzed retrospectively.

Statistical analysis

Data are reported as means ± standard deviation. Statistical analysis of the variables was performed in according to the total patients group, Group 1(No recurrence of atrial fibrillation) and Group 2(Recurrence of atrial fibrillation). Differences between groups of subjects were assessed by independent samples t test and ANOVA. A probability of <0.05 was regarded as significant. The statistical program SPSS version 11.5 for windows (SPSS Inc. Chicago Illinois) was used.

III. **RESULTS**

Clinical characteristics of patients

Thirty three (14.3%) patients of 230 patients who had taken ablation because of atrial flutter during the course of class IC or class III drug treatment for atrial fibrillation with no documented atrial flutter before drug treatment were assessed retrospectively. The mean age was 57.1 ± 10.8 years (range 31~74 years) and male were 30 patients (90.9%). The mean symptomatic atrial fibrillation duration before atrial flutter ablation was 70.6 ± 56.7 months (range 5.5 ~ 257.2 months) and the mean follow-up duration was 63.7 ±53.0 months (8.2 months ~ 5.96 years). Nine (27.35%) patients has structural heart disease including surgically corrected congenital heart disease (atrial septal defect n=1, ventricular septal defect n=2), hypertrophic cardiomyopathy (n=1), rheumatic heart disease (3), coronary artery bypass graft (n=2). In this patients, 24 of these patients received flecainide (72.7%) and 4 patients propafenone (12.1%), 4 patients amiodarone (12.1%) and 2 patients sotalol (6.1%).

After the clinical follow-up, total patients were divided into two groups, Group 1 (No recurrence of atrial fibrillation after RFA) and Group 2 (Recurrence of atrial fibrillation after RFA) for the evaluation of independent risk factors for recurrence of atrial fibrillation in Hybrid therapy. Comparing with two groups, pre-ablative atrial fibrillation duration was different in statistically (p=0.023). Other clinical parameters including age, sex, causative drugs, and combined structural heart

disease were not different between groups in statistically. Clinical characteristics of total patients, and Group 1, 2 was demonstrated below [Table 1]

Table 1. Clinical patient characteristics and variables of drug-induced atrial flutter of total patient and Group 1(No recurrence of atrial fibrillation after RFA), Group 2(Recurrence of atrial fibrillation after RFA).

	Total patients (n=33)	Group 1(n=18)	Group 2(n=15)	P value
Age	**57.1±10.8**	**59.6 ± 10.7**	**54.1 ± 10.4**	**0.148**
Sex(M:F)	**30:3**	**15:3**	**15:0**	**0.097**
AF duration (months)	**70.6 ± 56.7**	**50.5 ± 36.0**	**94.7 ± 68.2**	**0.023†**
AF duration ≥2yrs	**23(69.75%)**	**10(55.6%)**	**13(86.7%)**	**0.053**
Amiodarone	**4(12.1%)**	**3(16.7%)**	**1(6.7%)**	
Flecanide	**24(72.7%)**	**14(77.8%)**	**10(66.7%)**	**0.331**
Profafenone	**4(12.1%)**	**1(5.6%)**	**3(20.0) %)**	
Sotalol	**1(3.0%)**	**0(0%)**	**1(6.7%)**	
Structural heart disease	**9(27.35%)**	**5(27.8%)**	**4(26.7%)**	**0.943**
HTN	**13(39.4%)**	**9**	**4**	
DM	**13(39.4%)**	**8**	**8**	
CVA	**9(27.3%)**	**4**	**5**	**NS**
CAOD	**2(6.0%)**	**1**	**1**	
CHD	**3(9.0%)**	**1**	**2**	

Group 1; the patients who has not recurred of atrial fibrillation after RFA.
Group 2; the patients who has recurred of atrial fibrillation after RFA.
AF; atrial fibrillation, HTN; hypertension, DM; diabetes mellitus, CVA; cerebrovascular attack, CAOD; coronary artery occlusive disease, CHD; congenital heart disease, RFA; radiofrequency ablation. † $P < 0.05$

Electrocardiographic data.

Ten patients (30.3%) were diagnosed by chronic atrial fibrillation and 23 patients (69.7%) were diagnosed by paroxysmal atrial fibrillation. Common-type atrial flutter with inverted flutter waves in leads II, III, and aVF was found in 29

patients(87.9%) and uncommon-type atrial flutter with biphasic or upright flutter waves in 2 patients(6.1%), and both-type atrial flutter was found in 2 patients(6.1%). In none of the patients was documented atrial flutter before anti-arrhythmic drug treatment. The mean cycle length at atrial flutter at electrophysiologic study was 325.8 ± 127.6 ms. But there ware no statistical differences between two groups in electrocardiologic findings.

Table 2. Pre-ablative electrocardiographic characteristics.

	Total patients(n=33)	Group 1 (n=18)	Group 2 (n=15)	P value
Chronic AF	**10**	**5**	**5**	**0.730**
Paroxysmal AF	**23**	**13**	**10**	**0.730**
Typical AFL	**29 (88%)**	**16 (88.9%)**	**13 (86.7%)**	**0.981**
Cycle Length of AFL(ms)	**325.8 ± 127.6**	**333.9 ± 145.4**	**315.0 ± 106.9**	**0.746**

Group 1; the patients who has not recurred of atrial fibrillation after RFA.
Group 2; the patients who has recurred of atrial fibrillation after RFA.
AF; atrial fibrillation, AFL; atrial flutter

Echocardiographic data

Pre-ablative left ventricular dimension and left ventricular systolic function(LVEF) was within normal range in all patients. Pre-ablative echocardiographic data revealed no difference between two groups including left ventricular end-diastolic dimension(LVEDD), left ventricular end-systolic dimension(LVESD), ventricular septum wall thickness, posterior wall thickness and left ventricular systolic function. But the left atrial size(LA) measured by anterior-posterior distance in parasternal long axis view is more larger in Group

2(Recurred group) in statistically(p=0.027) and in combined with structural heart disease patients(p=0.018).

The patients over 44 mm of left atrial anterior-posterior diameter were common in recurred Group 2(Group 1, n=3(25%) vs Group 2, n=9(75%), p=0.029). The type of drug-induced atrial flutter(typical or atypical, p=0.359), atrial fibrillation class (chronic or paroxysmal, p=0.694) were not associated with left atrial size. Pre-ablative left atrial size was correlated with atrial fibrillation duration(r=0.367, p=0.042). Echocardiographic data was demonstrated as below [Table 3]

Table 3. Baseline echocardiographic parameters between groups

	Total patients(n=33)	Group 1 (n=18)	Group 2 (n=15)	P value
LVEDD(mm)	**50.9 ± 3.9**	**51.4 ± 3.3**	**50.3 ± 4.5**	**0.458**
LVESD(mm)	**34.3 ± 3.9**	**35.6 ± 4.6**	**33.1 ± 2.5**	**0.073**
LVEF (%)	**64.4 ± 9.3**	**62.4 ± 11.1**	**66.1 ± 6.7**	**0.213**
Septum thickness(mm)	**10.1 ± 2.6**	**10.2 ± 3.1**	**10.0 ± 2.2**	**0.870**
Posterior wall thickness(mm)	**9.7 ± 1.3**	**9.6 ± 1.5**	**9.8 ± 1.3**	**0.654**
LA AP(mm)	**44.3 ± 4.5**	**42.6 ± 3.4**	**46.2 ± 5.0**	**0.027†**
LA AP ≥44	**12(38.7%)**	**3(25%)**	**9(75%)**	**0.029†**

Group 1; the patients who had not recurred of atrial fibrillation after RFA.
Group 2; the patients who has recurred of atrial fibrillation after RFA
LVEDD; left ventricular end-diastolic dimension, LVESD; left ventricular end-systolic dimension, LA AP; left atrial anterior-posterior diameter, LVEF; left ventricular ejection fraction . †$p < 0.05$

Recurrence of atrial fibrillation & responsible factors

During a mean follow-up of 63.7 ± 53.0 months, the recurrence rate of atrial fibrillation of total patients in any one event on serial ECG or Holter monitoring was 45.5% (n=13). The other 18 (54.5%) patients were free of any recurrence of atrial fibrillation and symptom till the end of clinical follow-up.

The risk factors for recurrence were pre-ablative left atrial anterior-posterior diameter (odds ratio 7.5 CI of 95% 1.494 – 37.66, p=0.010), and atrial fibrillation duration (odds ratio 5.2, CI of 95% 0.899 – 30.078, p=0.049). Other factors including age, sex, pre-ablative anti-arrhythmic drug, anti-arrhythmic drug induced atrial flutter type (typical or atypical flutter), flutter cycle length, left ventricular end systolic & diastolic diameter, ventricular wall thickness, LV ejection fraction, association with structural heart disease were not associated with recurrence between groups in statistically.

Although above difference of recurrence, in recurred atrial fibrillation patients, only one patient was changed from rhythm control to rate control due to medical refractoriness to drug. However, except one patient, the incidence of atrial fibrillation episodes was significantly lower compared with that observed before therapy(9.2 → 3.1 episodes per year) in the other recurred patients and in the symptomatic even. And a symptom of atrial fibrillation was only paroxysmal and slow rate atrial fibrillation without symptoms.

Atrial fibrillation free survival after radiofrequency ablation of atrial flutter in according to left atrial size

By the definition of normal range of left atrial anterior-posterior diameter within 44mm, atrial fibrillation free survival duration between enlarged left atrial size and within normal ranged group is different in statistically. In normal LA sized patients, atrial free survival duration was 32.8 ±2.6 months and in enlarged LA sized patients, free survival duration was 10.1 ± 3.0 months(p=0.0054).[Figure 1]

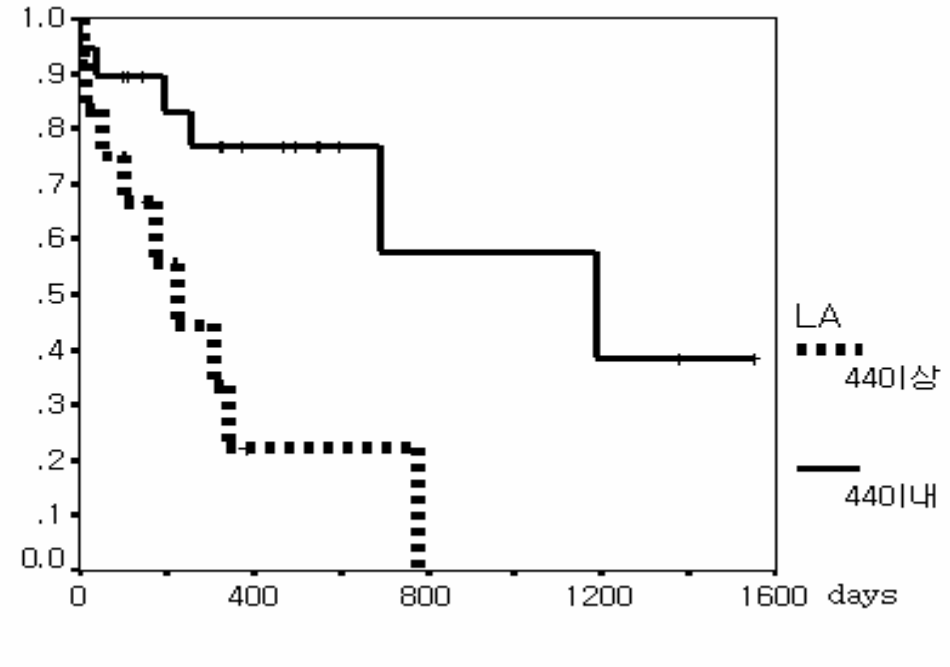

Figure 1. Kaplan-Meyer atrial fibrillation free survival graph. Atrial fibrillation cumulative free survival duration after RFA of atrial flutter in according with pre-ablative LA size (p=0.0054)

IV. DISCUSSION

Currently, long-term anti-arrhythmic drug administration remains the mainstay of therapy in patients with atrial fibrillation. But chemical cardioversion of atrial fibrillation using anti-arrhythmic drugs has only long term 10 to 30% success rate depending on drug and duration. Also most recurrence of atrial fibrillation after DC cardioversion was recurred within 3 months regardless of drugs[6].

Hybrid therapy of atrial fibrillation

Atrial fibrillation and atrial flutter, both intra-atrial re-entrant tachycardias with different electrophysiologic mechanisms, are frequently associated in an individual patient. Spontaneous and pharmacologic transformation of atrial fibrillation into atrial flutter has been well documented [7-8]. Development of atrial flutter due to administration of class Ic or class III anti-arrhythmic drugs for atrial fibrillation is a well-known phenomenon[9]. It gained special attention because 1:1 atrioventricular conduction with potentially life-threatening consequences was facilitated [10-12]. In safety studies with class Ic drugs, an incidence of 5% to 10% has been shown [13-16.] The overall incidence of conversion of atrial fibrillation to atrial flutter due to class Ic anti-arrhythmic drugs, which is not necessarily associated with a fast ventricular response, has not been investigated systematically. Burghard S et al [17] verified that the incidence of drug-related atrial flutter was upto 12.8% of patients who had undergone class Ic anti-arrhythmic drug therapy for atrial fibrillation. Hybrid

therapy is combined method of pharmacologic and non-pharmacologic therapy [18] was its indication of atrial fibrillation transformed to atrial flutter after initiation of drug treatment. Most commonly class Ic anti-arrhythmic drug or amiodarone and then after documented atrial flutter then radiofrequency ablation of atrial flutter need maintenance of normal sinus rhythm with maintenance of anti-arrhythmic drug for prevent re-emergence of atrial fibrillation.

Mechanism of drug-related atrial flutter

It is well established that atrial flutter is a macro-reentrant rhythm localized to the right atrium [19-21] that is determined by anatomic barriers [22-25]. In contrast, the mechanism of atrial fibrillation has not been fully elucidated up to now. Recent studies support the multiple wavelet hypothesis that atrial fibrillation involves a critical number of reentrant wavelets by suggested by Moe [26] et al. The anti-arrhythmic effe4ct of class Ic or III anti-arrhythmic drugs results from a decrease of intra-atrial conduction velocity. The slowing and organization of atrial fibrillation to atrial flutter is almost likely due to the depression of atrial conduction velocity with a consecutive transfer of conduction delay into conduction block. This prevents the simultaneous occurrence of the multiple reentrant circuits necessary for the perpetuation of atrial fibrillation and results in a single “atrial flutter” reentrant circuit, in which the area of slow conduction, that is, the sub-Eustachian isthmus, can be transformed into an area of conduction block by RF ablation.

The Class IC drug decrease intra-atrial conduction velocity. By this manner, slowing and organization of atrial fibrillation to atrial flutter: likely due to depression of atrial conduction velocity with a consecutive transfer of conduction delay into conduction block. In other words, Class IC may act preventing simultaneous occurrence of multiple reentrant circuits necessary for the perpetuation of atrial fibrillation then result in a single atrial flutter reentrant circuit, in which the area of slow conduction (sub-Eustachian isthmus, transformed into an area of conduction block by RFA)

Long term atrial fibrillation free survival.

The long term result of Hybrid therapy and risk factors for recurrence of atrial fibrillation was not fully known state. Bielik H [27] et al has documented that long term recurrence rate of atrial fibrillation was 63% in mean follow-up of 22.4±11.6 months for 46 patients undergoing hybrid therapy. Recently, Turco P [28] et al reported that atrial fibrillation event free survival was achieved in 53% over a mean of 54.1 ± 13.1 months in 82 consecutive patients. Reithmann C [29] et al (90 patients, 16 ± 13 months) reported the recurrence of atrial fibrillation was documented in 24 of 90 patients (27%). In this study, mean follow-up duration of this study is longest study as we know (63.7 ± 53.0 months) and the long term success rate was reached to 54.5% without any documentation of ECG or Holter evidence and symptom. This result on long term event free success rate was similar with previous study. Comparing with other treatment modality of atrial fibrillation –

antiarrhythmic drug only or DC cardioversion, Hybrid therapy is warranted modality of atrial fibrillation.

Risk factors of recurrence of atrial fibrillation in Hybrid therapy.

Turco P[28] et al A history of persistent AF, and the documentation of ≥ 1 spontaneous AFL episode before the flecainide test were independent predictors of successful hybrid therapy. Reithmann C[29] et al reported that the presence of accompanying pre-ablation episodes of atrial fibrillation on anti-arrhythmic treatment (Odds ratio 7.1, 95% CI 2.3 to 25, p=0.001) and decreased left ventricular ejection fraction (Odds ratio 3.7, 95% CI 1.01 to 12.5, p=0.048) were significant and independent predictors of post-ablation atrial fibrillation. In this study, he risk factors for recurrence were pre-ablative LA size (odds ratio 7.5 CI of 95% 1.494 – 37.66, p=0.010), and atrial fibrillation duration (odds ratio 5.2, CI of 95% 0.899 – 30.078, p=0.049). The suggestive cause of this result is atrial electrical & structural remodeling. Electrical remodeling is accompanied by a structural remodeling in the experimental model of persistent atrial fibrillation over several weeks (reference). Persistent atrial fibrillation leads to left atrial dilatation with abnormal atrial contractility. Also left atrial size is correlated with duration of atrial fibrillation [30], in this study, Pre-ablative left atrial size was correlated with atrial fibrillation duration(r=0.367, p=0.042). But other suggested risk factors were not correlated with recurrence of atrial fibrillation. The type of atrial fibrillation(chronic or paroxysmal, p=0.730), pre-ablative combined with structural heart

disease(p=0.8469), age, sex, class Ic or III drugs, LV systolic function, arterial hypertension were all not the predictors in univariate analysis.

Pre-ablative combined with structural heart disease was associated with more early recurrence of atrial fibrillation but statistically not significant (p=0.8469). Pre-ablative combined with structural heart disease was not related with recurrence of atrial fibrillation (p=0.943).

Effect on change of symptoms of Hybrid therapy.

Hybrid therapy on atrial fibrillation was found that is highly effective in reducing atrial fibrillation episodes in these patients. Burghard S [31]et al reported reduction of atrial fibrillation episode (follow-up 11 ± 4 months, 7.8 ± 9.2 per year → 2.7 ± 3.6 per year, $p<0.05$, n=19 compared with drug only use group) in paroxysmal atrial fibrillation patients treated with Hybrid therapy group. Bielik H [27] et al symptomatic relevant attenuation of symptoms was reduced by 65.8%.

Although there was no control groups in this study, in recurred atrial fibrillation patients, the symptomatic episodes of matched atrial fibrillation were reduced from 9.2 to 3.1 episodes per year except one patient(changed to rate control).

Study limitations

This study was not a planned randomized prospective study. Although all data were collected retrospectively, Hybrid therapy was performed previously documented atrial flutter which was induced after anti-arrhythmic drug therapy on

atrial fibrillation. Another point is that the incidence of atrial flutter induced from atrial fibrillation after anti-arrhythmic drug use could not be estimated. Although general incidence of Atrial flutter transformed from atrial fibrillation was reported 10 to 20%, this data were collected for the western people. There was no data on Asian people. In second, our experience on oral chemical cardioversion is preferable choice to flecanide, patients enrolled from other class Ic or III drugs were some small portion, even if previous study concluded that pre-ablative drugs were not associated with recurrence of atrial fibrillation. In third, all patients enrolled in this study usually have a normal systolic function. And lastly, Holter and event monitors were only available based on symptomatic recurrences; therefore, it is possible that some asymptomatic recurrences of atrial fibrillation were missed.

V. Conclusion

Hybrid therapy could be the choice of therapy as the first-line therapy for patients with anti-arrhythmic drug induced atrial flutter. Long term atrial fibrillation free-duration also. The pre-ablative atrial fibrillation duration and left atrial size is the strongest predictor of post-ablation recurrence of atrial fibrillation. Careful patient selection for Hybrid therapy of atrial fibrillation of not enlarged & short duration of atrial fibrillation may be warranted the long term stable sinus rhythm.

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ABSTRACT (IN KOREAN)

심방 세동 환자에서 약물로 인해 유발된 심방 조동 환자에서의 Hybrid 치료법의 장기 예후 및 재발 위험 예측 인자의 확인

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배경: 심장 세동은 난치성 부정맥으로 약물 또는 전기재세동에 의한 리듬 조절 치료의 경우 높은 재발률을 보인다. 그러나 항부정맥제재를 사용하는 경우 심방 조동으로의 변환이 오는 경우 하대정맥-삼첨판륜 협부의 고주파 전극도자 절제술 및 항부정맥 재제를 유지하는 Hybrid 치료법의 유용성 및 높은 성공률을 보였으나 아직 장기간의 성적과 재발의 위험인자에 대한 연구가 미진하였다. 본 연구에서는 심방세동의 치료로써 Hybrid 치료의 장기 성적과 그 위험인자를 확인하고자 고안되었다. **방법**: 1999 년 1 월부터 2005 년 5 월까지 시행된, 심방조동 하대정맥-삼첨판륜 협부 전극도자 절제술을 시행 받은 총 230 명의 환자 중 후향적 조사를 통해 33 명의 심방 세동으로부터 항부정맥재제 사용 후 발생한 심방조동을 확인하였다. 발작성 심방세동은 23 명, 지속성 심방세동 환자가 10 명이었으며 사용된 항부정맥제재는 Class IC 재제로 flecanide 24 명, profafenone 4 명이었으며 class II 재제로 amiodarone 4 명, sotalol 1 명으로 구성되었다. 전극도자 절제술 전 모든 환자에서 심 초음파가 시행되었으며 전극도자 절제술 후 항부정맥 재제를 지속적으로 복용하였다. 외래 추적 관찰은 정기적인 표면 표준 12 유도 심전도 검사를 시행하였으며 증상 발현 시 Holter 검사 등을 시행하여 재발 유부를 추적하였다. 기본 목표점은 전극도자 절제술 후 심방세동의 재발까지의 기간 이었으며 이차적으로 Hybrid 치료에 있어 재발

환자를 분석 독립적인 위험 인자를 통계적으로 분석하였다. **결과: 총 33 명의 환자에서 평균** 63.7 ± 53.0 달간 외래 추적이 이루어졌으며 심방세동이 15 명(45.5%)에서 재발하였다. 심방세동의 재발군과 비재발군간에는 성별, 연령, 전극 도자 절제술 전 약물의 항무정맥 재제의 종류, 동반된 기질적인 심 질환의 차이는 없었으나, 전극도자 절제술 전 심방세동의 기간(p=0.023)과 좌심방의 크기(p=0.027)만이 차이를 보였다. 또한 심방세동의 기간이 길수록 좌심방의 크기가 증가하는 경향을 보였다(r=0.367, p=0.042). 심방세동의 재발과 관련된 독립적인 위험인자는 전극도자 절제술 전 좌심방 크기(odds ratio 7.5, CI of 95% 1.494 – 37.66, p=0.010)와, 전극도자 절제술 전 심방 세동의 기간(odds ratio 5.2, CI of 95% 0.899 – 30.078, p=0.049)만이 위험 인자였다. 또한 심방세동이 재발된 군에서도 1 명을 제외하고 발생한 부정맥의 년간 빈도의 감소를 보였다(9.2 → 3.1 episodes per year). 또한 좌심방의 크기가 정상인군(LA AP<44mm)과 확장된 좌심방 군의 장기간의 심실 세동 재발에 관한 생존 분석상에서, 심방세동의 재발 없는 가간은 평균 985 ± 77 일대 304 ± 91 일로 통계적으로 의미 있는 결과(p = 0.0054)를 보였다. **결론**: 심방세동의 Hybrid 치료는 다른 치료법에 비해 장기간의 심방세동의 재발률을 낮출 수 있는 효율적인 방법이며, 재발과 관련된 인자로는 본 연구에서 전극도자 절제술전의 심방세동의 기간과 좌심방의 크기임을 확인하였다. 심방세동 환자에서 항부정맥재제 유발성 심방조동 환자에서 적절한 적응증인 경우, 장기간 심방세동의 재발을 막을 수 있는 효율적인 치료법이 될것이다.

핵심되는 말: Hybrid therapy, atrial fibrillation, atrial flutter, Class Ic/III anti-arrhythmic drug